

CUMULATIVE IMPACTS TECHNICAL REPORT  
FOR THE  
6TH AVENUE PARKWAY EXTENSION  
ENVIRONMENTAL ASSESSMENT

*Prepared for:*  
City of Aurora  
1551 East Alameda Parkway, Suite 3200  
Aurora, CO 80012

*Prepared by:*  
Felsburg Holt & Ullevig  
6300 S Syracuse Way, Suite 600  
Centennial, CO 80111

FHU Reference No. 114046-01  
June 2016

## TABLE OF CONTENTS

	<u>Page</u>
<b>1. Introduction</b>	<b>1</b>
1.1 Proposed Action	1
1.2 No Action Alternative	3
<b>2. Cumulative Impacts Assessment</b>	<b>4</b>
2.1 Cumulative Impacts Overview	4
<b>3. Past, Present, and Reasonably Foreseeable Future Actions</b>	<b>7</b>
3.1 Past and Current Actions in the Cumulative Impacts Study Area	7
3.2 Reasonably Foreseeable Future Actions in the Cumulative Impacts Study Area	8
<b>4. Resources Evaluated for Cumulative Impacts</b>	<b>11</b>
4.1 Traffic	11
4.1.1 Background	11
4.1.2 Current Trend or Health	11
4.1.3 Incremental Effect of Alternatives	11
4.1.4 Incremental Effect of All Actions	12
4.2 Air Quality	12
4.2.1 Background	12
4.2.2 Current Trend or Health	12
4.2.3 Incremental Effect of Alternatives	12
4.2.4 Incremental Effect of All Actions	17
4.3 Floodplains and Drainage Assessment	17
4.3.1 Background	17
4.3.2 Current Trend or Health	17
4.3.3 Incremental Effect of Alternatives	18
4.3.4 Incremental Effect of All Actions	18
4.4 Wetlands	19
4.4.1 Background	19
4.4.2 Current Trend or Health	19
4.4.3 Incremental Effect of Alternatives	19
4.4.4 Incremental Effect of All Actions	19
4.5 Biological Resources	20
4.5.1 Background	20
4.5.2 Current Trend or Health	20
4.5.3 Incremental Effect of Alternatives	20
4.5.4 Incremental Effect of All Actions	21
4.6 Land Use	21
4.6.1 Background	21
4.6.2 Current Trend or Health	21
4.6.3 Incremental Effect of Alternatives	22
4.6.4 Incremental Effect of All Actions	22

4.7	Parks, Recreation, and Open Space	22
4.7.1	Background	22
4.7.2	Current Trend or Health	22
4.7.3	Incremental Effect of Alternatives	23
4.7.4	Incremental Effect of All Actions	23
4.8	Noise	23
4.8.1	Background	23
4.8.2	Current Trend or Health	23
4.8.3	Incremental Effect of Alternatives	24
4.8.4	Incremental Effect of All Actions	24
4.9	Visual Resources	24
4.9.1	Background	24
4.9.2	Current Trend or Health	24
4.9.3	Incremental Effect of Alternatives	25
4.9.4	Incremental Effect of All Actions	25
5.	<b>Conclusion</b>	<b>26</b>
6.	<b>References</b>	<b>27</b>

## APPENDICES

- APPENDIX A – RESOURCE IMPACT TABLE
- APPENDIX B – RESOURCE MITIGATION TABLE

## LIST OF FIGURES

	<u>Page</u>
Figure 1	Proposed Action and Study Area----- 3
Figure 2	Cumulative Impact Study Area----- 5
Figure 3	Reasonably Foreseeable Future Actions in the Cumulative Impacts Study Area----- 10

## LIST OF TABLES

	<u>Page</u>
Table 1	Environmental Resources Considered in Cumulative Impact Analysis----- 6
Table 2	Summary of Future Actions in the Cumulative Impacts Study Area----- 9
Table 3	Statewide and Project Emissions Potential, Relative to Global Totals----- 14

## LIST OF ACRONYMS

AFB.....	Air Force Base
CEQ.....	Council on Environmental Quality
CFR.....	Code of Federal Regulations
CLOMR.....	Conditional Letter of Map Revision
CO <sub>2</sub> .....	Carbon Dioxide
CDOT .....	Colorado Department of Transportation
CWA .....	Clean Water Act
dBA.....	Noise Level - Decibel "A" Weighted
DRCOG .....	Denver Regional Council of Governments
E-470 .....	E-470 Tollway
EA.....	Environmental Assessment
EIS.....	Environmental Impact Statement
EPA .....	Environmental Protection Agency
FEMA.....	Federal Emergency Management Agency
FHWA.....	Federal Highway Administration
GHG .....	Greenhouse Gas
I-25 .....	Interstate 25
I-70 .....	Interstate 70
I-225 .....	Interstate 225
LOS .....	Level of Service
MMT .....	Million Metric Tons
MSAT.....	Mobile Source Air Toxics
NAAQS .....	National Ambient Air Quality Standards
NAC.....	Noise Abatement Criteria
NEPA.....	National Environmental Policy Act
RTP .....	Regional Transportation Plan
SH 30 .....	State Highway 30
TCGC .....	Triple Creek Greenway Corridor
VMT.....	vehicle miles traveled
vpd.....	vehicles per day

## 1. INTRODUCTION

This technical report has been prepared in support of the 6<sup>th</sup> Avenue Parkway Extension Environmental Assessment (EA) extending 6<sup>th</sup> Avenue from State Highway 30 (SH 30) to the E-470 Tollway (E-470). This technical report evaluates the effects of the Proposed Action and the No Action Alternative with respect to cumulative impacts.

### 1.1 Proposed Action

The Proposed Action would extend the 6<sup>th</sup> Avenue Parkway for approximately 2 miles along a new alignment, connecting existing 6<sup>th</sup> Avenue/SH 30 to the west with the existing 6<sup>th</sup> Avenue Parkway at E-470 to the east. This would close a gap in the existing major arterial street system, reducing out of direction travel and improving the efficiency and reliability of the transportation system. The Proposed Action would be a six-lane arterial roadway with a raised median and sidewalks.

Six initial alternatives were developed and screened through three screening levels to identify the Proposed Action. The alternatives screening is summarized in **Appendix A1 Alternatives Technical Report** of the EA. Details of the Proposed Action are presented in **Appendix A2 Conceptual Design Plans** of the EA.

The Proposed Action is shown on **Figure 1**. Major elements of the Proposed Action are identified by number from west to east on **Figure 1**, and include the following:

**Element 1. Tie into existing 6<sup>th</sup> Avenue/SH 30:** 6<sup>th</sup> Avenue/SH 30 is an existing two-lane arterial. At the western end of the Proposed Action, a signalized “thru-tee” type intersection would be constructed connecting the Proposed Action roadway to existing 6<sup>th</sup> Avenue/SH 30. This new signalized intersection would include bypass lanes for the eastbound SH 30 through movement or a thru-tee signalized intersection with bypass lanes for both the eastbound SH 30 through movement. The tie-in would be an urban curb and gutter section with three 12-foot travel lanes in each direction to connect to future 6-lane section to the west. A 10-foot sidewalk would be located on both the north and south sides of the roadway.

**Element 2. Triple Creek Trail realignment and connections:** A portion of the existing Triple Creek Trail would be realigned and would pass beneath the Proposed Action roadway which would be on a bridge at this location (see Element 3 in **Figure 1**). The Triple Creek Trail would be connected to 6<sup>th</sup> Avenue via a spur trail to the sidewalk constructed along the south side of the new roadway. The Triple Creek Trail is a 10-foot wide soft surface trail that serves equestrians, bicyclists and pedestrians. The realigned portion would match the existing width and surface. A 10-foot sidewalk on both sides of the bridge (Element 3) would provide connections to the trail. The southern terminus of the trail is currently at the Coal Creek Arena, and further extension to the south is planned by the City of Aurora.

**Element 3. Roadway bridge over Sand Creek:** Immediately east of the new intersection with existing 6<sup>th</sup> Avenue/SH 30 (Element 1 in **Figure 1**), the roadway would be elevated onto a six-lane bridge crossing over Sand Creek and its associated floodplain/floodway, and over the Triple Creek Trail. The bridge length and profile would be set to minimize impacts to Sand Creek, while still providing a minimum 10-foot vertical clearance over the Triple Creek Trail. The bridge would have a median and sidewalks. The bridge would be approximately 680 feet in length with 5 variable length spans supported on four piers. The bridge would be

designed to be compatible with the surrounding environment and to allow wildlife connectivity along Sand Creek and the Triple Creek Trail.

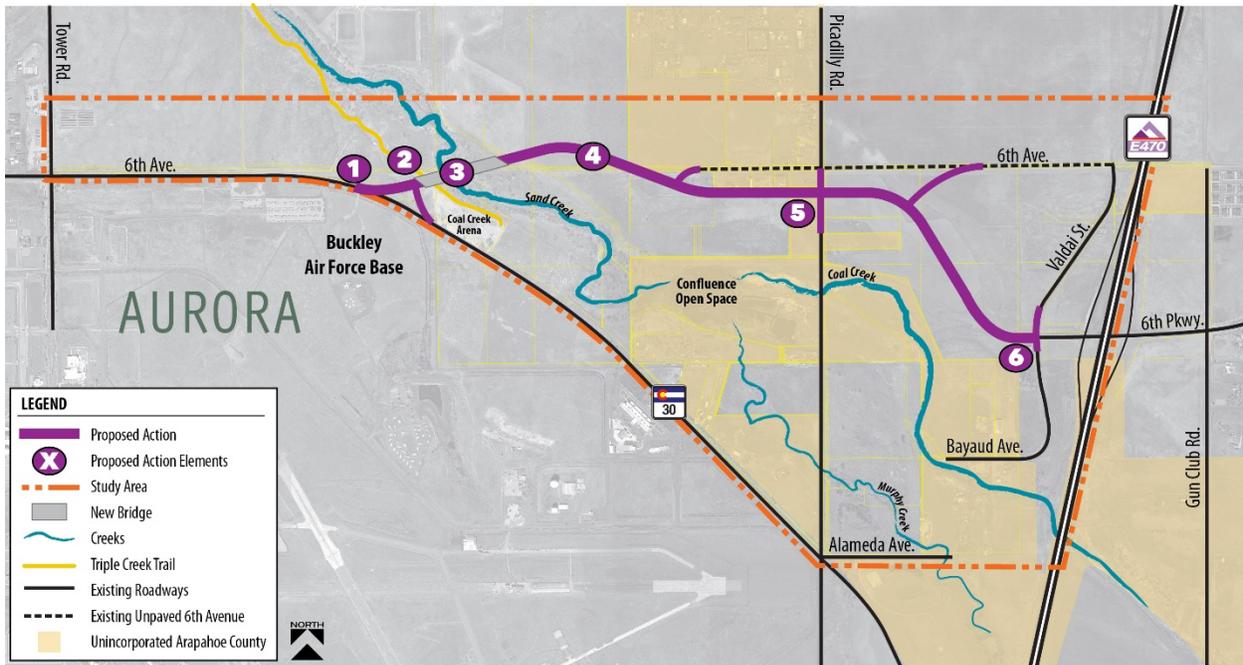
**Element 4. 6<sup>th</sup> Avenue Parkway arterial roadway:** The 6<sup>th</sup> Avenue Parkway extension would consist of a 144-foot wide, six-lane arterial roadway (three lanes in each direction) with a raised vegetated median. There would be curb and gutter and 10-foot wide sidewalks on the north and south sides of the roadway. The Proposed Action would provide two new access connections from the Proposed Action to two existing portions of 6<sup>th</sup> Avenue. One of these connections would provide access to the existing residences along unpaved 6<sup>th</sup> Avenue, west of Picadilly Road. The second connection would extend northeast from the Proposed Action to unpaved 6<sup>th</sup> Avenue to areas planned for development east of Picadilly Road.

**Element 5. Intersection with Picadilly Road:** The Proposed Action roadway would cross Picadilly Road, which is an existing north-south road. A signalized intersection would be constructed at this location. Picadilly Road is currently two lanes, but the City of Aurora anticipates that expansion to six lanes would occur in the future as a different project. Therefore, the intersection would be configured such that future expansion of Picadilly Road to six lanes can be accommodated and is not precluded.

**Element 6. Tie into existing 6<sup>th</sup> Avenue Parkway at E-470:** On its eastern end, the Proposed Action roadway would tie into the existing E-470 interchange, which currently truncates at this location, forming a connection with the existing 6<sup>th</sup> Parkway to the east of the interchange. The intersection tie-in at Valdai Street and 6<sup>th</sup> Avenue Parkway would be signalized. This connection would allow access from the west via the Proposed Action to the E-470 interchange and to the existing 6<sup>th</sup> Avenue Parkway extending to the east of E-470.

In addition to these transportation elements, the Proposed Action would include permanent roadway stormwater drainage with water quality features for roadway runoff and accommodate offsite stormwater flows. Details of drainage and water quality features are presented in **Appendix A6 Floodplains and Drainage Assessment Technical Report** of the EA.

Figure 1 Proposed Action and Study Area



Note: Numbers in graphic correspond with text above.

### 1.2 No Action Alternative

If the Proposed Action is not selected for implementation, there would be no improvements made to 6<sup>th</sup> Avenue beyond the existing and committed transportation system. The No Action Alternative was carried forward as a baseline comparison for environmental analysis purposes.

## 2. CUMULATIVE IMPACTS ASSESSMENT

### 2.1 *Cumulative Impacts Overview*

According to Council on Environmental Quality (CEQ) regulations, a cumulative effect “results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions and regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 Code of Federal Regulations [CFR] § 1508.7).

In other words, cumulative impacts result over time when impacts of an action are added to impacts of other actions. This effect can result in a compounded resource impact in the same geographic area. The CEQ guidance limits cumulative impact analysis to “important issues of national, regional, or local significance” (CEQ, 1997). Therefore, not all issues identified for impact assessment in this EA are analyzed for cumulative effects at the same level. Because of the wide geographic scope of a cumulative assessment and the variety of activities assessed, cumulative impacts are commonly examined at a more qualitative and less detailed level than direct impacts of the action alternatives.

For this project, cumulative impact assessment focuses on resources and issues located within the Cumulative Impact Study Area (**Figure 2**). This area encompasses the location where major travel pattern changes could occur as a result of implementing the project. Boundaries of the Cumulative Impact Study Area have been established using traffic analysis zones. In general, actions being considered have occurred since 1940 (just prior to early development of Buckley Field), or they will occur before 2040 (based on traffic and growth projections in the area). For this EA, resources identified for cumulative effects analysis are identified in **Table 1**.

Figure 2 Cumulative Impact Study Area

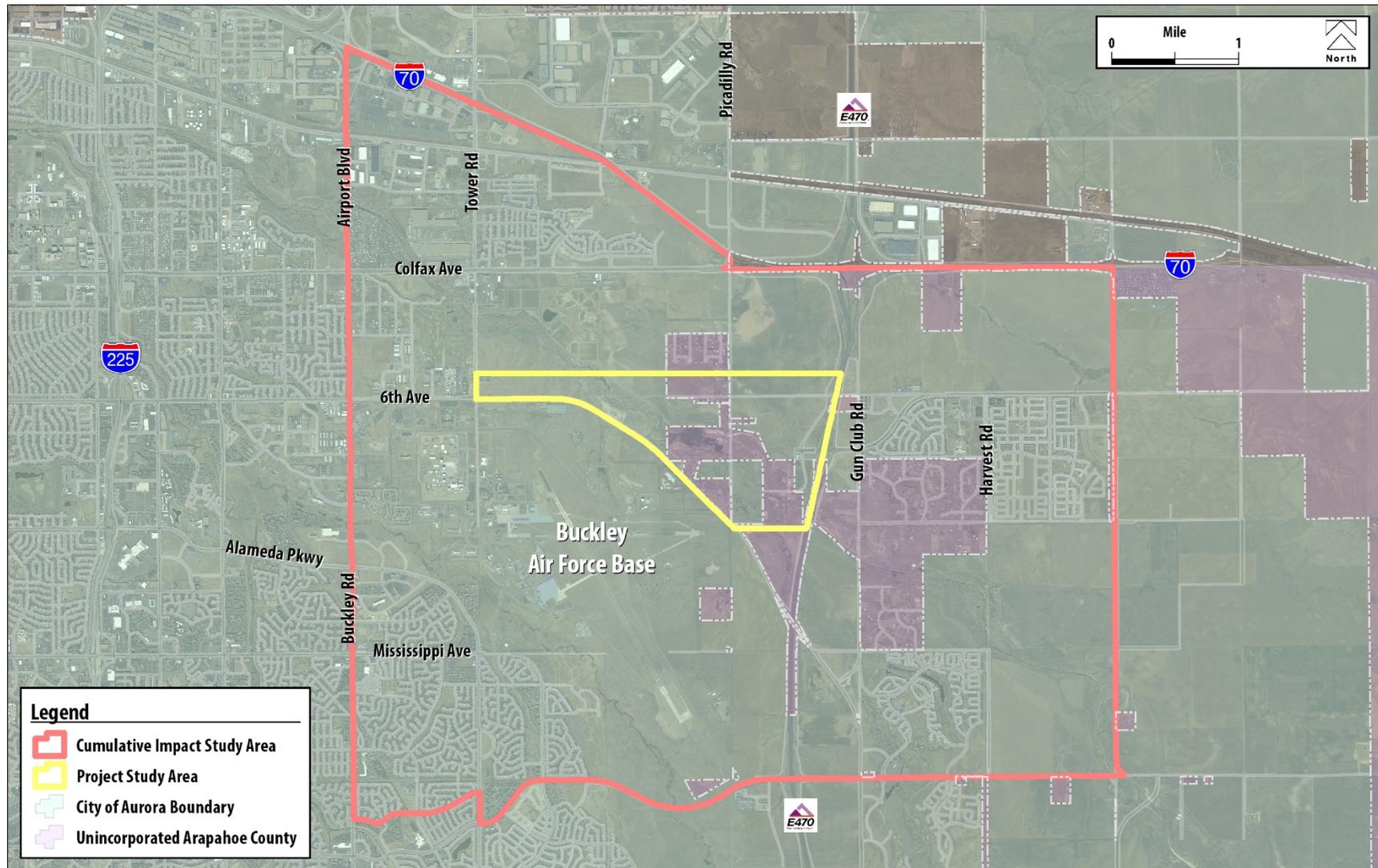


Table 1 Environmental Resources Considered in Cumulative Impact Analysis

Resources Evaluated for Cumulative Impacts in Section 3
<ul style="list-style-type: none"><li>■ Traffic</li><li>■ Air Quality</li><li>■ Floodplains and Drainage Assessment</li><li>■ Wetlands Delineation</li><li>■ Biological Resources (Vegetation, Noxious Weeds, Fish and Wildlife, Threatened and Endangered Species)</li><li>■ Land Use</li><li>■ Parks, Recreation, Open Space</li><li>■ Noise</li><li>■ Visual Resources</li></ul>
Resources Determined Not to Have Substantial Cumulative Impact
<ul style="list-style-type: none"><li>■ <b>Geologic Resources/Soil</b> – Impacts are directly related to disturbed areas and are not expected to have a measurable cumulative effect on geology and soil in the study area.</li><li>■ <b>Historic Properties</b> – The project would have no adverse effect on historic properties and would not cause an additive cumulative impact to historic resources.</li><li>■ <b>Archaeology</b> – No archaeological resources were found during the archaeological survey. The project is not expected to have an additive cumulative impact to archaeological resources.</li><li>■ <b>Paleontology</b> – No fossils were found during the paleontological survey. The project is not expected to have an additive cumulative impact to paleontological resources.</li><li>■ <b>Environmental Justice/Social Economics</b> – This project would produce a beneficial community effect in terms of improving local and regional connectivity along the transportation system.</li><li>■ <b>Residential/Business/Right of Way/Relocation</b> – No relocations are expected to occur with this project. Right of way acquisition will be minimal relative to the City of Aurora's and Arapahoe County's transportation systems.</li><li>■ <b>Utilities</b> – Project impacts are considered to be minor and will not have an adverse impact to the utility owners. The project is not expected to have an additive cumulative impact to utility resources.</li><li>■ <b>Energy</b> – Although energy usage would be anticipated during construction and operation of this corridor, it represents only a small portion of the energy usage relative to the City of Aurora's and Arapahoe County's transportation systems.</li><li>■ <b>Hazardous Materials</b> – No cumulative impacts to hazardous materials sites are expected. Measures would be implemented to address potential releases during construction.</li></ul>

### 3. PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

The cumulative impact analysis must take into consideration aspects of the environment affected by the proposed action and impacts of that action in relation to other past, present, and reasonably foreseeable actions in the vicinity and/or region. These other actions are considered in this analysis to:

- Establish the background status of the resource
- Describe the trend of the health of the resource
- Describe the incremental effect of our action on the resource (i.e., will the proposed action affect the trend of the resource)
- Conclude the overall effects from all the actions on the resource

#### 3.1 *Past and Current Actions in the Cumulative Impacts Study Area*

The City of Aurora has a history rich in military heritage. As shown on **Figure 2**, Buckley Air Force Base (AFB) is located just south of SH 30 and adjacent to the project study area (i.e., the limits defined for impact analyses for most resources), which is further encompassed by broader limits of the Cumulative Impact Study Area. This site originated as Buckley Field in 1941 and became Buckley AFB in 2000. It comprises over 3,000 acres and serves 92,000 active duty, National Guard, Reserve, retired, and civilian personnel with air and land operations, offices, and support buildings.

Beyond the limits of Buckley AFB, the Cumulative Impact Study Area comprises a mixture of rural development with some agricultural uses eastward and low-density to suburban residential and commercial development westward. The Cumulative Impact Study Area began to experience an increase in development in the late 1990s, related to completion of E-470 through Aurora.

The City of Aurora was identified as one of the fastest growing cities in the United States in the *City of Aurora Comprehensive Plan 1986*, which is where the initial extension of 6<sup>th</sup> Avenue was discussed (City of Aurora, 1986). Subsequently, in 1996, the City of Aurora completed a *Preliminary Alignment Study for East 6<sup>th</sup> Avenue from SH 30 to 3000 feet East of Gun Club Road* that deemed the importance of making a connection to support future growth (Nolte & Associates, 1996). In 1997, in anticipation of growth the City prepared a *Conceptual Phase II Alignment Study for 6<sup>th</sup> Avenue* (Nolte & Associates, 1997). These studies were prepared anticipating growth in the area. Population growth has continued, with the Aurora's population increasing by 17.6 percent between from 2000 to 2010 (City of Aurora, 2012a).

Aurora has worked in coordination with the Federal Highway Administration (FHWA), Colorado Department of Transportation (CDOT), and Denver Regional Council of Government (DRCOG) to advance the 6<sup>th</sup> Avenue Parkway extension through the planning process toward ultimate project design and construction. The 6<sup>th</sup> Avenue Parkway extension project is included in the current *DRCOG 2040 Fiscally Constrained Regional Transportation Plan*, adopted February 18, 2015 (DRCOG, 2015a). Through this regional transportation planning process, the project is included in the DRCOG Carbon Monoxide and Particulate Matter Air Quality Conformity

Determination and the Denver Southern Subarea 8-hour Ozone Conformity Determination (DRCOG, 2015b).

The City of Aurora and Arapahoe County have conducted a collaborative planning effort to establish parks, recreation, and open spaces, resulting in the Triple Creek Greenway Corridor (TCGC). This Corridor serves to provide a protected greenway through the part of Arapahoe County and eastern Aurora and serves regional users. The TCGC passes through the study area with future plans to extend to the southeast, eventually reaching Aurora Reservoir (City of Aurora, 2011).

In northwestern portions of the Cumulative Impact Study Area, CDOT is currently completing environmental studies and preliminary design for the Interstate 70 (I-70) East project, which will reconstruct I-70 mainline, interchanges, and access roads from Interstate 25 (I-25) to Tower Road.

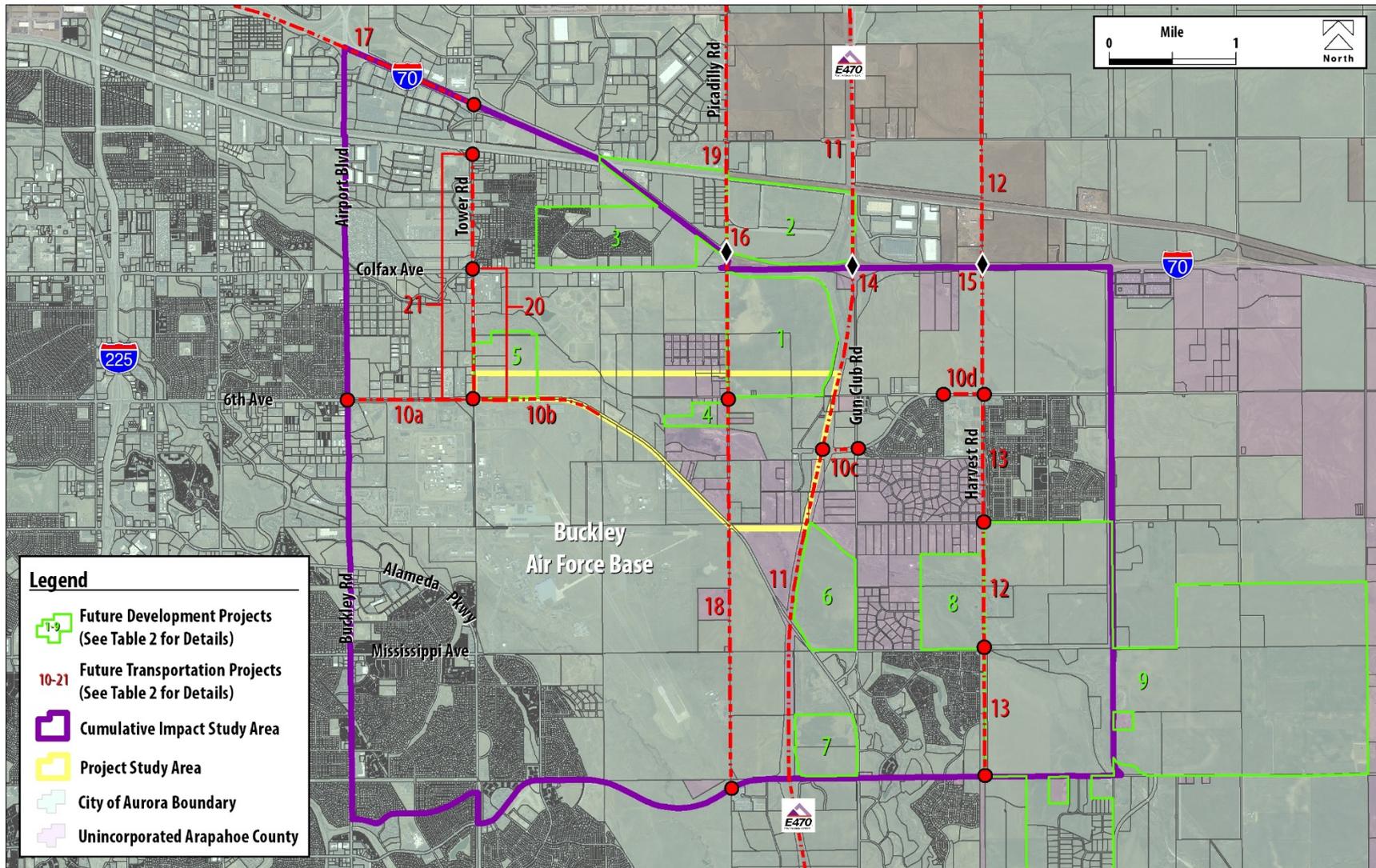
### *3.2 Reasonably Foreseeable Future Actions in the Cumulative Impacts Study Area*

Reasonably foreseeable actions are those future activities that have been committed to or that are known proposals. These actions are expected to occur within the Cumulative Impact Study Area and within the defined planning horizon (by 2040). For this evaluation, other actions have been identified as reasonably foreseeable projects from DRCOG's *2040 Fiscally Constrained Regional Transportation Plan* (RTP) (DRCOG, 2015), from Capital Improvement Programs of City of Aurora (2012b) and Arapahoe County (2015), and through coordination with the City of Aurora and CDOT. The summary of other actions is included in **Table 2** and **Figure 3**.

Table 2 Summary of Future Actions in the Cumulative Impacts Study Area

Project Name	Description	Figure 3 Map ID
<i>Future Development Projects in the Cumulative Impact Study Area</i>		
Horizon Uptown	490 acres of mixed use, sustainable, urban community	1
Park Eastgate	380 acres for bulk distribution	2
Aurora East	600-acre development	3
Colorado Christian Fellowship	44-acre development	4
Upper Sand Creek	160-acre development	5
Murphy Creek North	240 acres of residential development	6
Jewell Commons	150 acres of mixed use development	7
Waterstone	240 acres of residential development	8
The Parklands	3,400 acres of residential development	9
<i>Future Transportation Projects in the Cumulative Impact Study Area</i>		
Widening of existing 6 <sup>th</sup> Avenue/ 6 <sup>th</sup> Parkway	Widen from 2 to 6 lanes from Airport Blvd to Tower Road	10a
	Widen from 2 to 6 lanes from Tower Road to 6 <sup>th</sup> Parkway	10b
	Widen from 2 to 6 lanes from E-470 to Gun Club Road	10c
	Widen from 2 to 6 lanes from 6 <sup>th</sup> Parkway to Harvest Mile Road	10d
E-470 Widening	Widen from 4 to 6 lanes from Parker Road to I-70 and I-70 to Pena Boulevard (Arapahoe, Douglas, Adams, Denver Counties)	11
Harvest Road/ Harvest Mile Road New Alignment	New 6 lanes from I-70 to 56 <sup>th</sup> Avenue, 6 <sup>th</sup> Avenue to I-70, and Mississippi Avenue to Alameda Avenue (Adams and Arapahoe Counties)	12
Harvest Road/ Harvest Mile Road Widening	Widen from 2 or 3 lanes to 6 lanes from Alameda Avenue to 6 <sup>th</sup> Avenue and Jewell Avenue to Mississippi Avenue (Arapahoe County)	13
I-70 and E-470 Interchange	Interchange upgrades (Adams and Arapahoe Counties)	14
I-70 and Harvest Mile Road Interchange	New interchange (Adams and Arapahoe Counties)	15
I-70 and Piccadilly Road Interchange	New interchange (Adams and Arapahoe Counties)	16
I-70 East Corridor	In accordance with CDOT's Draft Environmental Impact Statement (EIS) and Supplemental Draft EIS, reconstruct I-70 mainline, interchanges, and access roads from I-25 to Tower Road	17
Piccadilly Road New Alignment	New 4 or 6 lanes from Jewell Avenue to 6 <sup>th</sup> Parkway and Colfax Avenue to I-70 (Arapahoe and Adams Counties)	18
Piccadilly Road Widening	Widen from 2 to 6 lanes from I-70 to Smith Road, Smith Road to 48 <sup>th</sup> Avenue, and 6 <sup>th</sup> Avenue to Colfax Avenue (Adams and Arapahoe Counties)	19
Tower Road New Alignment	New 2 lanes from 6 <sup>th</sup> Avenue to Colfax Avenue (Arapahoe County)	20
Tower Road Widening	Widen from 2 to 6 lanes from Colfax Avenue to Smith Road and 6 <sup>th</sup> Avenue to Colfax Avenue (Adams and Arapahoe Counties)	21
Sources: Arapahoe County, 2015a; DRCOG, 2015a; City of Aurora, 2012b		

Figure 3 Reasonably Foreseeable Future Actions in the Cumulative Impacts Study Area



## 4. RESOURCES EVALUATED FOR CUMULATIVE IMPACTS

The reasonably foreseeable projects would have the same impacts under the No Action Alternative as they would under the Proposed Action as these actions are independent from this study and would occur regardless of which alternative is selected. These developments include the conversion of land from a natural state to a developed one, resulting in impacts to traffic, air quality, floodplains and drainage assessment, wetlands delineation, biological resources (vegetation, noxious weeds, fish and wildlife, threatened and endangered species), land use, parks, recreation, open space, noise, and visual resources.

### 4.1 Traffic

This resource is addressed comprehensively in **Appendix A3 Traffic Technical Report**.

#### 4.1.1 Background

Current average daily traffic along SH 30 ranges from 10,300 vehicles per day (vpd) to 17,300 vpd. Currently, signalized intersections at Airport Boulevard, Telluride Street, and Tower Road mostly operate at Level of Service (LOS) D or better in the peak hours. In the PM peak hour, the Airport Boulevard intersection currently operates at LOS F. Generally, at stop controlled intersections in the study area, turn movements from stop controlled approaches operate at LOS D or better.

#### 4.1.2 Current Trend or Health

Traffic volumes and travel demand are expected to continue to increase in the Cumulative Impacts Study Area as a result of increasing population growth and land development. Under the No Action Alternative,<sup>1</sup> SH 30 traffic volumes are expected to grow at a rate of four to five percent per year, which is a reasonable rate for rapidly developing suburban areas. Under the Proposed Action, traffic volume growth projections along SH 30 between Tower Road and Airport Boulevard are expected to be even higher.

#### 4.1.3 Incremental Effect of Alternatives

##### No Action Alternative

The No Action Alternative would have a negative effect on traffic and mobility in the area. Robust traffic growth along the SH 30 corridor is expected over the next 20 plus years. Analysis has concluded that LOS F operations would be expected at key intersections along the highway (SH 30 and Picadilly Road and SH 30 and Airport Boulevard).

##### Proposed Action

The Proposed Action is expected to have a positive incremental effect on traffic and mobility in the area. The Proposed Action would reduce travel time and travel distance between the growing areas of northeast Aurora to the Interstate 225 (I-225) corridor. In addition to travel time improvements, the Proposed Action would complete a vital east-west connection for this growing area of the Denver metropolitan region. Traffic modeling of the Proposed Action shows the extension reducing traffic on parallel routes and attracting existing traffic to the SH 30 corridor. The primary reason for this effect is that the extension connects E-470 and rapidly growing areas of Aurora to the I-225 corridor. In the traffic analysis, regional travel patterns were analyzed, and most study intersections in the peak hours are anticipated to operate at LOS C.

<sup>1</sup> The No Action Alternative includes all projects identified in DRCOG's *Fiscally Constrained RTP (DRCOG, 2015)* and all locally funded projects except for the Proposed Action.

#### 4.1.4 Incremental Effect of All Actions

In this relatively undeveloped section of Aurora, new development is planned to occur over the next 20 to 25 years. DRCOG forecasts for 2035 in the study area anticipate population nearly doubling and employment more than doubling. As noted, the Proposed Action would complete an east-west connection for this growing area and would connect E-470 and rapidly growing areas of Aurora to the I-225 corridor. Other transportation improvement projects listed in **Table 2** will provide incremental traffic improvement. When combined with other past, present, and reasonably foreseeable future actions, the Proposed Action is expected to improve overall traffic conditions in the Cumulative Impacts Study Area when compared with the No Action Alternative.

## 4.2 Air Quality

This resource is addressed comprehensively in **Appendix A4 Air Quality Technical Report**.

### 4.2.1 Background

The study area lies in the eastern Denver metropolitan area, where maintenance plans are in place to ensure compliance with the National Ambient Air Quality Standard (NAAQS) for at least 10 years into the future. These plans consider air quality impacts from probable growth in the maintenance areas from both vehicles and other pollutant sources. By their nature, the plans are cumulative.

### 4.2.2 Current Trend or Health

Generally speaking, regulatory controls are in place to ensure that cumulative air quality impacts do not occur from the combination of air pollutant sources in the Denver metropolitan area. In terms of the NAAQS pollutants, DRCOG completes regional conformity analyses for the *2040 Fiscally Constrained RTP* (DRCOG, 2015a) and Transportation Improvement Program, which has been prepared to assure regional air quality conformity. Projects occurring under the No Action Alternative and the Proposed Action are all included in that analysis. In addition, the Proposed Action is also depicted in DRCOG's *Carbon Monoxide and PM<sub>10</sub> Conformity Determination* (DRCOG, 2011) and in the Denver Southern Subarea 8-hour Ozone Conformity Determination (DRCOG, 2015b).

### 4.2.3 Incremental Effect of Alternatives

#### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on air quality. In terms of the NAAQS pollutants, DRCOG completes regional conformity analyses for the 2040 Fiscally Constrained RTP and Transportation Improvement Program, which has been prepared to assure regional air quality conformity. Projects occurring under the No Action Alternative are included in that analysis.

#### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on air quality.

#### **NAAQS**

In terms of the NAAQS, the Proposed Action is included in DRCOG's *2040 Fiscally Constrained RTP*, which has been prepared to assure regional air quality conformity. The net cumulative effect on regional air quality with the Proposed Action is taken into account in the regional

conformity analysis performed by DRCOG for the RTP and Transportation Improvement Program.

### Climate Change

Climate change is an important national and global concern. While the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide (CO<sub>2</sub>) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane and nitrous oxide.

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the earth's atmosphere. Because atmospheric concentrations of GHGs continue to climb, our planet will continue to experience climate-related phenomena. For example, warmer global temperatures can cause changes in precipitation and sea levels.

To date, no national standards have been established regarding GHGs, nor has the Environmental Protection Agency (EPA) established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO<sub>2</sub> under the Clean Air Act. However, there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate Change, the US National Academy of Sciences, and EPA and other federal agencies. GHGs are different from other air pollutants evaluated in federal environmental reviews because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere, which is characteristic of these gases. The affected environment for CO<sub>2</sub> and other GHG emissions is the entire planet. In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad scale actions such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project's emissions.

Under the National Environmental Policy Act (NEPA), detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making.<sup>2</sup> FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of the Proposed Action, as discussed below and shown in **Table 3**, that the GHG emissions from the Proposed Action will not result in "reasonably foreseeable significant adverse impacts on the human environment" (40 CFR 1502.22(b)). The change in GHG emissions from the Proposed Action will be insignificant, and will not play a meaningful role in a determination of the environmentally preferable alternative or the selection of the Proposed Action. More detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or to making a decision in the best overall

<sup>2</sup> See 40 CFR 1500.1(b), 1500.2(b), 1500.4(g), and 1501.7

public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternatives-level GHG analysis has been performed for this project.

The context in which the emissions from the proposed project will occur, together with the expected GHG emissions contribution from the project, illustrate why the project's GHG emissions will not be significant and will not be a substantial factor in the decision-making. The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation. The transportation sector was responsible for approximately 27 percent of all anthropogenic (human caused) GHG emissions in the U.S. in 2010.<sup>3</sup> The majority of transportation GHG emissions are the result of fossil fuel combustion. CO<sub>2</sub> makes up the largest component of these GHG emissions. U.S. CO<sub>2</sub> emissions from the consumption of energy accounted for about 18 percent of worldwide energy consumption CO<sub>2</sub> emissions in 2010<sup>4</sup>. U.S. transportation CO<sub>2</sub> emissions accounted for about 6 percent of worldwide CO<sub>2</sub> emissions.<sup>5</sup>

While the contribution of GHGs from transportation in the U.S. as a whole is a large component of U.S. GHG emissions, as the scale of analysis is reduced the GHG contributions become quite small. Using CO<sub>2</sub> because of its predominant role in GHG emissions, **Table 3** presents the relationship between current and projected Colorado highway CO<sub>2</sub> emissions and total global CO<sub>2</sub> emissions, as well as information on the scale of the project relative to statewide travel activity.

**Table 3 Statewide and Project Emissions Potential, Relative to Global Totals**

2010 Global CO <sub>2</sub> Emissions, MMT <sup>6</sup>	2010 Colorado Motor Vehicle CO <sub>2</sub> Emissions, MMT <sup>7</sup>	2010 Colorado Motor Vehicle Emissions, % of Global Total	% Change in Statewide VMT due to Proposed Action
29,670	10.3	0.0348	-0.03

**Notes:** MMT = million metric tons.

Global emissions estimates are from International Energy Outlook 2010.

<sup>3</sup> Calculated from data in U.S. Environmental Protection Agency, Inventory of Greenhouse Gas Emissions and Sinks, 1990-2010.

<sup>4</sup> Calculated from data in U.S. Energy Information Administration International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy, <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8>, accessed 2/25/13.

<sup>5</sup> Calculated from data in EIA figure 104: <http://www.eia.gov/forecasts/archive/ieo10/emissions.html> and EPA table ES-3: <http://epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf>

<sup>6</sup> These estimates are from the EIA's *International Energy Outlook 2010*, and are considered the best-available projections of emissions from fossil fuel combustion. These totals do not include other sources of emissions, such as cement production, deforestation, or natural sources; however, reliable future projections for these emissions sources are not available.

<sup>7</sup> MOVES projections suggest that Colorado motor vehicle CO<sub>2</sub> emissions may increase by 14.9 percent between 2010 and 2040; more stringent fuel economy/GHG emissions standards will not be sufficient to offset projected growth in VMT.

Based on emissions estimates from EPA's MOVES model<sup>8</sup>, and global CO<sub>2</sub> estimates and projections from the Energy Information Administration, CO<sub>2</sub> emissions from motor vehicles in the entire state of Colorado contributed approximately 0.0348 percent of global emissions in 2010. The Proposed Action would reduce slightly the overall Colorado vehicles miles traveled (VMT) (0.03 percent) by reducing some out-of-direction travel in the study area. This difference accounts for considerably less than one ten-thousandth of one percent of estimated global CO<sub>2</sub> emissions. This very small change in global emissions is well within the range of uncertainty associated with future emissions estimates.<sup>9,10</sup>

#### *Mitigation for Global GHG Emissions*

To help address the global issue of climate change, the U.S. Department of Transportation is committed to reducing GHG emissions from vehicles traveling on our nation's highways. The U.S. Department of Transportation and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward less carbon-intensive fuels. The agencies have jointly established new, more stringent fuel economy and first ever GHG emissions standards for model year 2012–2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.<sup>11</sup> Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO<sub>2</sub> emissions in future years.

Consistent with its view that broad-scale efforts hold the greatest promise for meaningfully addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO<sub>2</sub> emissions—and to assess the risks to transportation systems and services from climate change. In an effort to assist States and MPOs in performing GHG analyses, FHWA has developed a *Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process*. The Handbook

<sup>8</sup> <http://www.epa.gov/otaq/models/moves/index.htm>. EPA's MOVES model can be used to estimate vehicle exhaust emissions of carbon dioxide (CO<sub>2</sub>) and other GHGs. CO<sub>2</sub> is frequently used as an indicator of overall transportation GHG emissions because the quantity of these emissions is much larger than that of all other transportation GHGs combined, and because CO<sub>2</sub> accounts for 90 to 95 percent of the overall climate impact from transportation sources. MOVES includes estimates of both emissions rates and VMT, and these were used to estimate the Colorado statewide highway emissions in **Table 4**.

<sup>9</sup> For example, Figure 114 of the Energy Information Administration's *International Energy Outlook 2010* shows that future emissions projections can vary by almost 20%, depending on which scenario for future economic growth proves to be most accurate.

<sup>10</sup>When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency is required make clear that such information is lacking (40 CFR 1502.22). The methodologies for forecasting GHG emissions from transportation projects continue to evolve and the data provided should be considered in light of the constraints affecting the currently available methodologies. As previously stated, tools such as EPA's MOVES model can be used to estimate vehicle exhaust emissions of carbon dioxide (CO<sub>2</sub>) and other GHGs. However, only rudimentary information is available regarding the GHG emissions impacts of highway construction and maintenance. Estimation of GHG emissions from vehicle exhaust is subject to the same types of uncertainty affecting other types of air quality analysis, including imprecise information about current and future estimates of vehicle miles traveled, vehicle travel speeds, and the effectiveness of vehicle emissions control technology. Finally, there presently is no scientific methodology that can identify causal connections between individual source emissions and specific climate impacts at a particular location.

<sup>11</sup> For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy website: <http://www.nhtsa.gov/fuel-economy/>.

presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level, and will demonstrate how such evaluation may be integrated into the transportation planning process. FHWA has also developed a tool for use at the statewide level to model a large number of GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and metropolitan planning organizations in assessing climate change vulnerabilities to their transportation networks, FHWA has developed a draft vulnerability and risk assessment conceptual model and has piloted it in several locations.

At the state level, there are also several programs underway in Colorado to address transportation GHGs. The Governor's Climate Action Plan, adopted in November 2007, includes measures to adopt vehicle CO<sub>2</sub> emissions standards and to reduce vehicle travel through transit, flex time, telecommuting, ridesharing, and broadband communications. CDOT issued a Policy Directive on Air Quality in May 2009. This Policy Directive was developed with input from a number of agencies, including the State of Colorado's Department of Public Health and Environment, EPA, FHWA, the Federal Transit Administration, the Denver Regional Transportation District and the Denver Regional Air Quality Council. This Policy Directive and implementation document, the CDOT Air Quality Action Plan, address unregulated mobile source air toxics and GHGs produced from Colorado's state highways, interstates, and construction activities.

As a part of CDOT's commitment to addressing mobile source air toxics (MSATs) and GHGs, some of CDOT's program wide activities include:

- Researching pavement durability opportunities with the goal of reducing the frequency of resurfacing and/or reconstruction projects.
- Developing air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools, including development of vehicle idling reduction programs for schools and communities.
- Offering outreach to communities to integrate land use and transportation decisions to reduce growth in VMT, such as smart growth techniques, buffer zones, transit-oriented development, walkable communities, access management plans, etc.
- Committing to research additional concrete additives that would reduce the demand for cement.
- Expanding Transportation Demand Management efforts statewide to better utilize the existing transportation mobility network.
- Continuing to diversify the CDOT fleet by retrofitting diesel vehicles, specifying the types of vehicles and equipment contractors may use, purchasing low-emission vehicles, such as hybrids, and purchasing cleaner burning fuels through bidding incentives where feasible.
- Exploring congestion and/or right-lane only restrictions for motor carriers.
- Funding truck parking electrification.

- Researching additional ways to improve freight movement and efficiency statewide.
- Committing to use ultra-low sulfur diesel for non-road equipment statewide.
- Developing a low-volatile organic compounds emitting tree landscaping specification.

Even though project-level mitigation measures will not have a substantial impact on global GHG emissions because of the exceedingly small amount of GHG emissions involved, the above-identified activities are part of a program-wide effort by FHWA and CDOT to adopt practical means to avoid and minimize environmental impacts in accordance with 40 CFR 1505.2(c).

### *Summary*

This document does not incorporate a project-level analysis of the GHG emissions or climate change effects of the Proposed Action because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the potential GHG impacts, the impacts will not be meaningful to a decision on the environmentally preferable alternative or to a choice among alternatives. As outlined above, FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly CO<sub>2</sub> emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. Finally, the construction best practices described above represent practicable project-level measures that, while not substantially reducing global GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the Federal-aid highway program.

#### 4.2.4 Incremental Effect of All Actions

As noted, regulatory controls are in place to ensure that cumulative air quality impacts do not occur from the combination of air pollutant sources in the Denver metropolitan area. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact air quality.

### 4.3 *Floodplains and Drainage Assessment*

This resource is addressed comprehensively in **Appendix A6 Floodplains and Drainage Assessment Technical Report**.

#### 4.3.1 Background

The study area includes three drainageways with Federal Emergency Management Agency (FEMA) regulated floodplains: Coal Creek, Murphy Creek, and Sand Creek. Murphy Creek flows into Coal Creek which then forms Sand Creek. The locations of these creeks lead to large and interconnected floodplains.

#### 4.3.2 Current Trend or Health

Relatively sparse development currently exists in the Cumulative Impacts Study Area. Potential influences on floodplains currently tend to be from natural causes, including flooding, low flow channel migration, and erosion. In terms of drainageways, any new development requires new drainage infrastructure to manage potential impacts and to minimize effects of runoff.

### 4.3.3 Incremental Effect of Alternatives

#### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on floodplains and drainage.

#### **Floodplains**

For the No Action Alternative, impacts to the floodplain are likely to be minimal by the year 2040. The only potential impacts would be due to natural changes from flooding, low flow channel migration, and erosion. These factors might result in minor changes to floodplain limits but would not be quantifiable at this level of analysis.

#### **Drainage**

No drainage impacts would be anticipated as a result of the No Action Alternative; however, no permanent water quality features would be installed.

#### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on floodplains and drainage. Permanent water quality features would be installed with the Proposed Action.

#### **Floodplains**

The Proposed Action would impact the Sand Creek floodplain, however, the crossing is far enough north that it would not impact the Murphy Creek or Coal Creek floodplains. Impacts to the Sand Creek floodplain include a maximum rise in water surface elevation of approximately 1.2 feet and changes to the floodplain and floodway delineation given grading to accommodate the new roadway. These impacts would occur on City of Aurora property and a parcel of land in negotiation for purchase by the City of Aurora, which is currently owned by Buckley AFB. These impacts would be mitigated and addressed through a Conditional Letter of Map Revision (CLOMR) application. The CLOMR process takes into account other projects in the area that are changing the floodplain/floodway so that cumulative rises do not occur. Impacts to other property or areas of the floodplain are unlikely as a result of these changes.

#### **Drainage**

This Proposed Action would alter existing drainage patterns, increase runoff to Sand and Coal Creeks, and include construction of new drainage improvements. Although drainage impacts are anticipated, the Proposed Action represents only a small portion of Aurora's and Arapahoe County's transportation systems and is therefore not substantial. Permanent water quality features would be installed with the Proposed Action.

### 4.3.4 Incremental Effect of All Actions

Additional floodplain and drainage impacts would be expected to occur as other development in the area occurs that is not associated with the No Action Alternative or the Proposed Action. Similar to these alternatives, impacts from other actions would be subject to regulatory controls and mitigation for local and regional floodplain and stormwater management. While the Proposed Action could have impacts to floodplains and drainage, this alternative would not substantially affect these resources in relation to historical and future cumulative impacts from land development. Future conditions within the study area that could occur are described in the *Sand Creek (I-225 to E-470) Right Bank Tributaries Outfall Systems Plan (OSP) Conceptual Design Report (Draft)*, recently completed for the City of Aurora and UDFCD (Merrick, 2015).

Future improvements include detention facilities that will reduce the peak flowrates and enhance water quality within each tributary watershed and Sand Creek, as well as storm sewers and open channels to convey detained runoff to Sand and Coal Creeks. This system combined with the permanent water quality features installed as part of the Proposed Action would improve drainage in the study area. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact floodplains and drainage.

#### 4.4 Wetlands

This resource is addressed comprehensively in **Appendix A7 Wetlands Delineation Technical Report**.

##### 4.4.1 Background

Hydrologic features are aggregated generally near the center of the project study area, where the convergence of Murphy Creek and Coal Creek occurs. These features include freshwater emergent wetlands, freshwater ponds, and riverine areas. Vegetation in the study area includes native trees, shrubs, and grasses, along with non-native weeds. Wetland plant species exist along the TCGC, and upland plant species exist in the surrounding open lands.

##### 4.4.2 Current Trend or Health

Vegetation in the study area is un-impaired and is relatively high quality because of the presence of Sand Creek, Coal Creek, Murphy Creek, un-named tributaries and the lack of overall development surrounding the perennial streams and riparian corridors in the study area. Relatively sparse development currently exists in the Cumulative Impacts Study Area. The general health of hydrologic features and vegetation, including wetlands is positive.

##### 4.4.3 Incremental Effect of Alternatives

###### No Action Alternative

No wetland impacts would be anticipated as a result of the No Action Alternative.

###### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on wetlands. The Proposed Action would permanently impact 0.11 acre and temporarily impact 0.60 acre of wetlands as a result of constructing the new road alignment. The Proposed Action would also potentially impact a total of approximately 577 linear feet of stream channel or stream bank associated with Sand Creek and Coal Creek. However, as the Proposed Action is designed in further detail, these impact quantities will diminish by incorporating avoidance measures and minimization measures. Impacts to stream channel or banks will be reduced during the hydraulic engineering design process. Final impacts will require a Section 404 permit under the Clean Water Act (CWA), and mitigation would be required for all wetland impacts.

##### 4.4.4 Incremental Effect of All Actions

Additional wetland impacts would be expected to occur as other development in the area occurs that is not associated with the Proposed Action. Similar to the Proposed Action, impacts from other actions would be subject to regulatory controls, coordination with the U.S. Army Corps of Engineers, and potential mitigation. While the Proposed Action would have impacts to wetlands, it would not substantially affect wetlands in relation to historical and future cumulative impacts from land development. When combined with other past, present, and reasonably foreseeable

future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact wetlands.

## 4.5 *Biological Resources*

This resource is addressed comprehensively in **Appendix A8 *Biological Resources Technical Report***.

### 4.5.1 Background

The study area is generally surrounded by sparse development, including Buckley AFB; high- and low-density, single-family residences and commercial businesses; E-470; surrounding agricultural lands; and recreational ball fields. The natural characteristics of this ecoregion have been replaced by development; however, the blue grama-buffalo grass association was observed in many upland areas around the study area. The natural vegetation in the study area consists primarily of native and non-native grasses, weedy forbs, shrubs, and trees throughout the stream and riparian areas and in the open areas in and adjacent to the study area.

### 4.5.2 Current Trend or Health

Vegetation and habitat in the study area are generally un-impaired and are relatively high quality because of the presence of Sand Creek, Coal Creek, Murphy Creek, un-named tributaries and the lack of overall development surrounding the perennial streams and riparian corridors in the study area. Sparse development currently exists in the Cumulative Impacts Study Area. The general health of vegetation and habitat is positive.

### 4.5.3 Incremental Effect of Alternatives

#### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on vegetation and noxious weeds, fish and wildlife, or threatened and endangered species.

#### **Vegetation and Noxious Weeds**

Under the No Action Alternative, no impacts to vegetation would be expected. Given the nature of noxious weeds, the No Action Alternative could result in further spread of weeds throughout the study area and to adjacent lands unless the City, Arapahoe County, and local landowners effectively treat existing noxious weed populations.

#### **Fish and Wildlife**

Under the No Action Alternative, impacts to wildlife could include additional loss, degradation, and fragmentation of habitat due to development in the surrounding landscape. In addition, continual degradation of the TCGC and surrounding riparian habitat could occur from expansion of noxious weeds and compaction from the use of social trails in the study area.

#### **Threatened and Endangered Species**

Cumulative impacts to special status species associated with the No Action Alternative would be similar to impacts identified in the previous paragraph for fish and wildlife.

### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on vegetation and noxious weeds, fish and wildlife, or threatened and endangered species.

#### **Vegetation and Noxious Weeds**

Construction of the Proposed Action would result in a loss of vegetation in terms of cover and species composition. The increase in impervious surfaces from the project and additional development would cause an increase in stormwater runoff and exposure of the surrounding vegetation to higher levels of pollutants. Given the nature of noxious weeds, the Proposed Action could result in further spread of weeds throughout the study area and to adjacent lands, although measures will be taken during construction to minimize that spread.

#### **Fish and Wildlife**

The Proposed Action would result in permanent loss of shortgrass prairie, which would directly result in permanent loss of habitat for terrestrial species, and potential cover for aquatic species. Effects to wildlife from implementation of the Proposed Action would include permanent habitat loss, degradation/disruption of habitat (for example, noise effects), and fragmentation of habitat due to the construction of the new roadway. These effects could be increased by additional development in surrounding areas.

#### **Threatened and Endangered Species**

Impacts to special status species associated with the Proposed Action would be similar to impacts identified in the previous paragraph for fish and wildlife.

#### **4.5.4 Incremental Effect of All Actions**

Similar to the No Action Alternative and Proposed Action, other actions could result in spread of weeds throughout the study area and to adjacent lands unless the City, Arapahoe County, and local landowners effectively treat existing noxious weed populations. Other actions and developments could also affect fish and wildlife and threatened and endangered species by contributing to loss, degradation, and fragmentation of habitat. While the Proposed Action would have impacts to biological resources, this alternative would not substantially affect wildlife in relation to historical and future cumulative impacts from land development. The TCGC provides protection for habitat and biological resources. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact biological resources.

### **4.6 Land Use**

This resource is addressed comprehensively in **Appendix A12 Land Use Technical Report**.

#### **4.6.1 Background**

The study area is located in the City of Aurora and unincorporated portions of Arapahoe County and is adjacent to Buckley AFB. The study area is predominantly undeveloped and includes several park, recreation, and open space properties. Rural residences and light industrial land uses are also scattered throughout the study area.

#### **4.6.2 Current Trend or Health**

The study area includes a former sand and gravel mine that is being redeveloped to adjoin Confluence Open Space. As the Denver metropolitan area continues to grow, development of

former agricultural land in the study area is being converted to suburban residential and employment uses.

#### 4.6.3 Incremental Effect of Alternatives

##### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on land uses. For the No Action Alternative, right-of-way would not be acquired and project improvements would not be constructed beyond the existing and committed transportation system. The No Action Alternative would not directly impact land use. The No Action Alternative may indirectly impact land use by making the area less attractive for development given the lack of transportation facilities and connectivity.

##### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on land uses. The Proposed Action would convert small amounts of park, recreation, and open space land; residential parcels; and agricultural/pasture properties to a transportation use due to roadway construction and right of way. Impacts to land use by the Proposed Action would have a minor overall effect on land use in the area. The Proposed Action could have the indirect effect of facilitating planned growth more quickly by making local and regional transportation options more attractive with direct access to E-470.

#### 4.6.4 Incremental Effect of All Actions

Land uses are regulated at the local level to ensure that development generally coincides with local agency/community plans and visions. Based on plans for this area in terms of future developments and transportation improvements, land in the Cumulative Impact Study Area will continue to be developed for a variety of uses regardless of whether the Proposed Action is implemented. The Proposed Action and other planned actions are consistent with local land use and comprehensive plans. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact land uses.

### 4.7 *Parks, Recreation, and Open Space*

This resource is addressed comprehensively in **Appendix A16 Parks, Recreation, Open Space and Section (4f) Analysis Technical Report**.

#### 4.7.1 Background

The study area is rich in parks, recreation, and open space properties and serves as a piece of the TCGC. The TCGC is a collaborative planning effort by Arapahoe County and the City of Aurora prepared under the auspices of the Arapahoe County Open Space Program. The TCGC Study serves as the foundation for a planned extension of the Triple Creek Trail, which passes through the study area. Triple Creek Trail is a regional trail project proposed by the City of Aurora and unincorporated areas of Arapahoe County.

#### 4.7.2 Current Trend or Health

The TCGC is a swath of land that follows Sand Creek, Coal Creek, and Murphy Creek. The Greenway protects the natural function of drainages, such as flood mitigation, stormwater and water quality management, and habitat for nature. It also serves recreation and transportation purposes.

### 4.7.3 Incremental Effect of Alternatives

#### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on park, recreation, and open space resources. Under the No Action Alternative parks, recreation, or open spaces would remain intact and would not experience bifurcation or impacts. Access to the resources would continue to be limited to the few access points that exist today from Tower Road and the Coal Creek Arena.

#### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on park, recreation, and open space resources. The Proposed Action would convert small amounts of park, recreation, and open space land to transportation uses including portions from the Environmental Day Camp, and Triple Creek Trail. The impacts to these resources are expected to be minor in relation to the total amount of open space in the area and may serve as enhancements to the overall open space system, such as the access trail spur from the Proposed Action to the Triple Creek Trail. In addition, the City of Aurora and Arapahoe County are actively purchasing land parcels and converting them from undeveloped to open space to accommodate the TCGC.

### 4.7.4 Incremental Effect of All Actions

Further land development and construction of other transportation projects are anticipated within the Cumulative Impacts Study Area, but their impact to park, recreation, and open space resources is expected to be minimal. As noted, the TCGC is publically owned and managed to protect the natural function of the local creek drainages and to offer recreation and transportation opportunities. With the City of Aurora and Arapahoe County actively adding land area to the TCGC, more park, recreation, and open space resources are anticipated in the study area. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact park, recreation, and open space resources.

## 4.8 Noise

This resource is addressed comprehensively in **Appendix A17 Noise Technical Report**.

### 4.8.1 Background

The study area includes residential, recreation, undeveloped, and business areas that are of interest for this project's noise analysis. The current traffic noise conditions in the study area were assessed through a combination of measurements and modeling.

### 4.8.2 Current Trend or Health

Surrounded by sparse development, the study area tends to be relatively quiet. Short-term traffic noise measurements were performed at five locations over several hours to document ambient conditions for noise model verification. One measurement result reached or exceeded the CDOT Noise Abatement Criteria (NAC) for Category B, though this was not at a formal noise receptor location. No planes from Buckley AFB were observed during the measurements. When aircraft are present, noise conditions certainly become more noticeable.

### 4.8.3 Incremental Effect of Alternatives

#### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on noise. Under the No Action alternative, three of the modeled points would be impacted from 2035 traffic noise levels being above the NAC during the peak noise hour. One modeled point was calculated to have a substantial (11 decibel “A” weighted [dBA]) noise increase over existing levels; however, that point would also be above the NAC and, therefore, was already counted as an impact. Two homes along Picadilly Road would be impacted by noise due to growth in traffic. The other impacted receptor would be the Coal Creek Arena, which is a Category C property owned by the City of Aurora.

#### Proposed Action

The Proposed Action is not expected to have an adverse incremental effect on noise. With the Proposed Action, seven of the modeled points would be impacted from 2035 traffic noise levels being at or above the NAC during the peak noise hour. Eight modeled points were calculated to have a noise increase of 10 dBA or more over existing levels; the largest increase was 19 dBA. Five of these points were also calculated to be above the NAC and already counted as impacted; three of the points were not above the NAC. Therefore, a total 10 of the model points were found to be impacted by noise. Of the 10 impacted receptors, eight are residences in the study area and two are recreation areas in the TCGC owned by the City of Aurora.

### 4.8.4 Incremental Effect of All Actions

Based on plans for this area in terms of future developments and transportation improvements, noise levels in the Cumulative Impact Study Area will continue to increase regardless of which alternative is selected. Impacts to traffic noise levels by either the No Action Alternative or the Proposed Action would have a minor overall effect on noise receptors in the area. The incremental impact is not substantial in comparison to the extent of historical and future cumulative impacts involving noise. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to result in traffic noise impacts greater than those identified above.

## 4.9 Visual Resources

This resource is addressed comprehensively in **Appendix A18 Visual Resources Technical Report**.

### 4.9.1 Background

The TCGC is within the network of other greenway corridors in the region, including the Sand Creek Greenway, High Line Canal, South Platte River, and Cherry Creek. The City of Aurora and Arapahoe County are establishing the TCGC to connect the terminus of the Sand Creek Regional Greenway at the High Line Canal with the Aurora Reservoir. When completed, the combined greenways will form an uninterrupted 27-mile corridor from the Aurora Reservoir to the South Platte River.

### 4.9.2 Current Trend or Health

The visual resources study area is a sparsely developed “island” of shortgrass prairie and riparian open space within the Colorado Front Range urban zone. Integral to the landscape character of the Front Range are the rivers, creeks, and canals that define historic and

contemporary patterns of growth. These rivers, creeks, and canals also form networks of recreation, wildlife, and scenic corridors.

#### 4.9.3 Incremental Effect of Alternatives

##### No Action Alternative

The No Action Alternative is not expected to have an adverse incremental effect on visual resources. Under the No Action Alternative, the Triple Creek Corridor would retain its visual quality as public open space. No visual impacts would be expected.

##### Proposed Action

With the Proposed Action, the SH 30 intersection and Sand Creek bridge would be in the immediate foreground of the Triple Creek Trail and Coal Creek Arena viewsheds. The visual contrast of built elements, the removal of vegetation, and the alteration of existing landscape features would reduce the overall visual quality of the corridor. Within the uplands, the roadway alignment and Picadilly Road intersection would be in the immediate foreground of rural residential viewsheds. The visual contrast of built elements with the existing landforms would alter the agrarian character and panoramic setting of the upland area. East of Picadilly Road the roadway alignment and Picadilly Road intersection would have the potential to be visually compatible with future planned development.

#### 4.9.4 Incremental Effect of All Actions

Based on plans for this area in terms of future developments and transportation improvements, the visual character of the Cumulative Impact Study Area will continue to change regardless of which alternative is selected. Visual impacts related to the Proposed Action will be mitigated to blend earthwork with surrounding contours and road features with existing contours and vegetation. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative or the Proposed Action would not be expected to substantially adversely impact visual resources.

## 5. CONCLUSION

In conclusion, the direct and indirect impacts of either the No Action Alternative or the Proposed Action would not incrementally result in a substantial cumulative impact for the resources analyzed. Land in the Cumulative Impact Study Area will continue to be developed for a variety of uses regardless of which alternative is selected. These factors have been and continue to be the primary cause of impacts to traffic, air quality, floodplains and drainage assessment, wetlands delineation, biological resources (vegetation, noxious weeds, fish and wildlife, threatened and endangered species), land use, parks, recreation, open space, noise, and visual resources. The manner in which development and use occurs, as managed by local agencies with jurisdiction in the area, will shape the environment into the future. When combined with other past, present, and reasonably foreseeable future actions, the No Action Alternative and the Proposed Action would not be expected to substantially adversely impact the resources analyzed.

## 6. REFERENCES

- Arapahoe County. 2015a. *Capital Improvement Program Projects and Studies*. Retrieved March 25, 2015, from <http://www.arapahoegov.com/index.aspx?NID=628>
- Arapahoe County. 2015b. Oil and Gas Wells Online GIS. Retrieved March 25, 2015, from <http://gis.arapahoegov.com/oilgas/>
- City of Aurora. 1986. Comprehensive Plan.
- City of Aurora. 2011. *Triple Creek Greenway Corridor Study*. City of Aurora Parks, Recreation, and Open Space Department, Planning, Design and Construction Division.
- City of Aurora. 2012a. *Who is Aurora? An overview of demographic and social data and trends*. Planning & Development Services Department. September.
- City of Aurora. 2012b. *Operating and Capital Improvement Budget*. January 31.
- Colorado Oil and Gas Conservation Commission GIS Online. Retrieved March 25, 2015 from <http://dnrwebmapgdev.state.co.us/mq2012app/>
- Council on Environmental Quality (CEQ). 1997. *Considering Cumulative Effects Under the National Environmental Policy Act*. Office of the President.
- Denver Regional Council of Governments (DRCOG). 2011. *DRCOG CO and PM10 March 2011 Conformity Determination*. Accessed webpage on November 23, 2015 [https://drcog.org/documents/FINAL%20-%20DRCOG%20CO\\_PM10%20-%202012-2017%20TIP%20conformity.pdf](https://drcog.org/documents/FINAL%20-%20DRCOG%20CO_PM10%20-%202012-2017%20TIP%20conformity.pdf)
- DRCOG. 2015a. *2040 Fiscally Constrained Regional Transportation Plan*. Accessed webpage on November 23, 2015 <https://drcog.org/sites/drcog/files/resources/2040%20Fiscally%20Constrained%20Regional%20Transportation%20Plan.pdf>
- DRCOG. 2015b. *Denver Southern Subarea 8-Hour Ozone Conformity Determination*. Accessed webpage on November 23, 2015 [https://drcog.org/sites/drcog/files/resources/FINAL%202016-2021%20TIP\\_Southern%20Subarea%208-hour%20Ozone%20conformity\\_1.pdf](https://drcog.org/sites/drcog/files/resources/FINAL%202016-2021%20TIP_Southern%20Subarea%208-hour%20Ozone%20conformity_1.pdf)
- Merrick & Company. 2015. *Sand Creek (I-225 to E-470) Right Bank Tributaries Outfall Systems Plan Conceptual Design Report (Draft)*. October.
- Nolte and Associates, Inc. 1996. *Preliminary Alignment Study East 6<sup>th</sup> Avenue, From State Highway 30 to 3000' East of Gun Club Road*. April 1996 Revised March 1997.
- Nolte and Associates, Inc. 1997. *Conceptual Phase II Alignment Study East 6<sup>th</sup> Avenue, From State Highway 30 to 3000' East of Gun Club Road*. December 1997 Revised July 1998.

## Appendix A Resource Impact Table

Resource	Context	No Action Alternative	Proposed Action
Cumulative Impacts	<p>Cumulative impacts have been examined for a cumulative impacts study area surrounding and extending at least one mile in all directions from the project study area. The cumulative impacts study area includes Buckley AFB, and also a developing area of Aurora and Arapahoe County. In addition to Buckley AFB, notable features in the cumulative impacts study area include I-70 to the north, E-470 to the west, the Triple Creek Greenway Corridor, and the Aurora Sports Park. Development is planned and is occurring over time on privately owned land within the area.</p>	<p>Cumulative impact analysis is not relevant to the No Action Alternative.</p>	<p>Cumulative impacts to traffic, air quality, floodplains and drainage, wetlands, biological resources, land use, parks, recreation and open space, noise and visual resources have been examined. The Proposed Action along with other transportation improvements (DRCOG, 2015a) would reduce future traffic congestion and delays which are generally increasing over time in the area.</p> <p>Air quality in the Denver metro area has generally been improving over the past several decades, through the actions of federal, state, regional and local agencies; this trend is expected to continue and is consistent with reduction in future congestion provided by the Proposed Action.</p> <p>Would add incrementally to impacts to floodplains, drainage, wetlands, and biological, land use, noise and visual resources. These resources have been impacted and are likely to continue to be impacted over time as development occurs on previously undeveloped lands.</p>

## Appendix B Resource Mitigation Table

Mitigation Category	Proposed Action Impact	Mitigation Commitments for the 6 <sup>th</sup> Avenue Extension Project	Responsible Branch	Timing/Phase that Mitigation will be Implemented
Cumulative Impacts	None likely	Not required	NA	NA